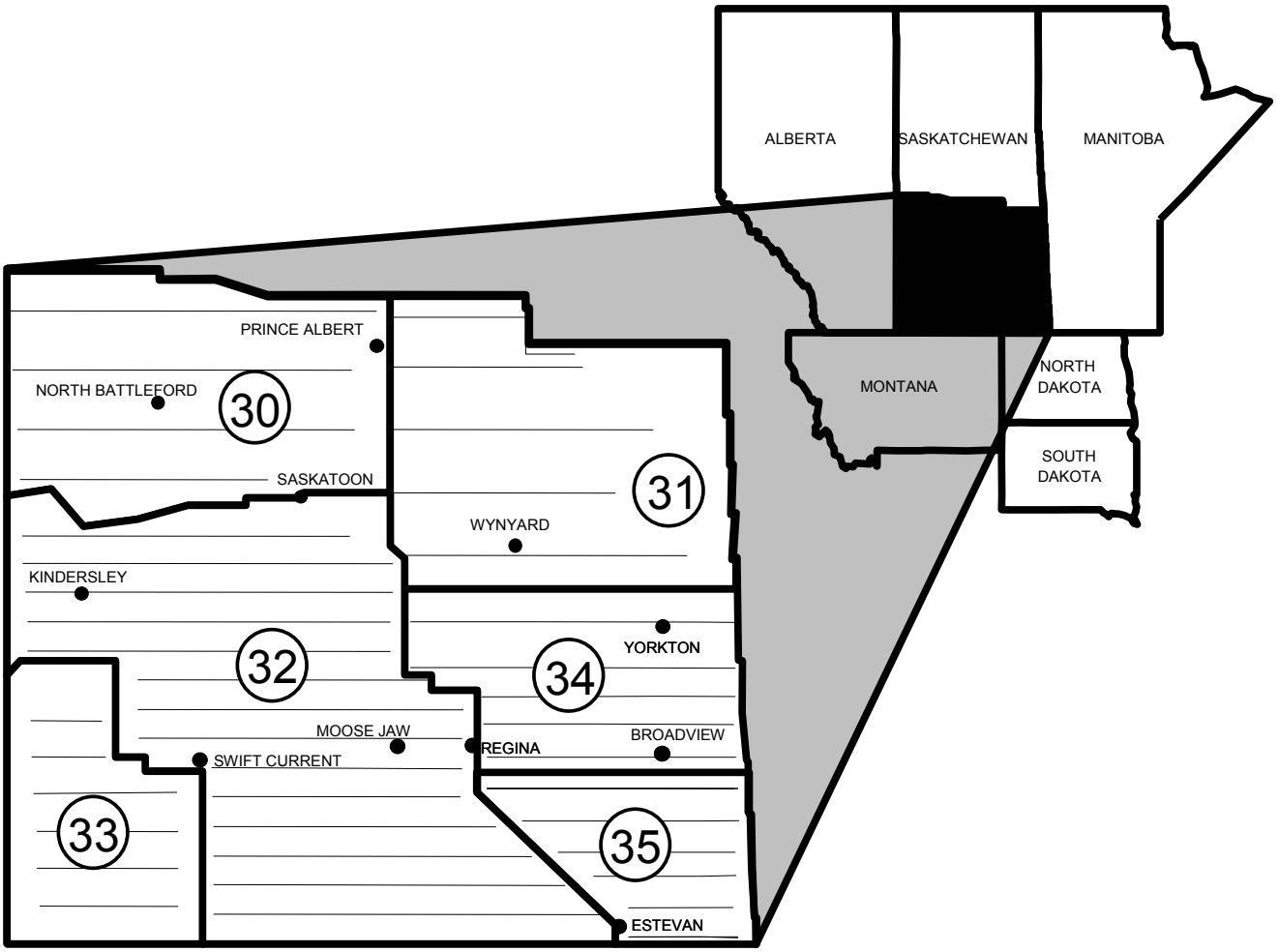
WATERFOWL PRODUCTION SURVEY
SOUTHERN SASKATCHEWAN
2003



U.S. FISH & WILDLIFE SERVICE

DEPARTMENT OF THE INTERIOR

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

TITLE: Waterfowl Production and Habitat Survey for Southern Saskatchewan

STRATA SURVEYED: 30, 31, 32, 33, 34, and 35

DATES: July 8 - 20, 2003

DATA SUPPLIED BY: United States Fish and Wildlife Service

Air Crew

Strata 30, 31, 32, and 33
Pilot/Observer: Philip P. Thorpe, Flyway Biologist, USFWS
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Strata 34 and 35
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ABSTRACT: Average to below average precipitation was received across most of the Southern Saskatchewan survey area during June and July. Pond indices were 17% higher than the 2002 index, but 36% and 11% lower than the 10-year mean, and the long-term mean, respectively. The overall brood index was 271%, 56%, and 7% higher than the 2002 index, the 10-year mean, and the long-term mean, respectively. The late-nesting index was 6%, 5%, and 18% lower than the 2002 index, the 10-year mean, and the long-term mean, respectively. Overall, recruitment is expected to be good out of southern areas, poor in the northwest, west and northeast survey areas and average across the remainder of the survey area. Excellent recruitment might result from south-central areas of the survey unit.

METHODS: The procedures followed in conducting the July Waterfowl Production and Habitat Survey are described in the Standard Operating Procedures for Aerial Waterfowl Breeding Population and Habitat Surveys in North America, Section IV, revised 1987. There were no changes made this year in operating procedures. Survey coverage was complete and all data are considered comparable to previous years (Table 1). We used a Cessna 206 and a Cessna 206 equipped with amphibious floats to survey strata 30-33 and strata 34-35, respectively. Data was collected using a GPS/voice recording system (Thorpe 2000). During the period 8-20 July, we flew approximately 60 and 22 hours to complete the transect flights in strata 30-33 and 34-35, respectively. We were delayed 2 days because of weather in strata 30-33; the strata 34-35 crew was delayed 1 day due to weather.

WEATHER AND HABITAT CONDITIONS: Thunderstorms were the primary source of precipitation during June and July and the amount received across the Province varied widely. The west-central areas around Moose Jaw and Swift Current received well-above average precipitation during June (Agriculture and Agri-food Canada 2003). The northeast, south, southeast, and central portions of the survey area received below average precipitation; the remainder of the survey area received average precipitation. A frontal system brought 1-2 days of rain early in July, primarily in the northern grainbelt, but the remainder of the month was hot,

dry, and windy and moisture conditions have deteriorated since May. The southwest was the driest part of the Province with only a trace of rain received to date. The northeast benefited most from the frontal system with an average of 34 mm of rainfall (Saskatchewan Watershed Authority 2003). The remainder of the Province received only 20–22 mm from the frontal system and has only received a trace to 13 mm during the remainder of the month.

Pond counts were 17% higher than 2002, but were 36% and 11% lower than the 10-year mean and long term mean, respectively (Table 2). In an average year, the pond estimates will drop about 50% from the May estimates. This year, the pond estimates averaged 60% lower than May, ranging from 34-75% lower. The southwest had the biggest decline in pond numbers and correspondingly had the lowest rainfall during June and July. The southeast and central areas also dried up dramatically from the May survey; however, the northwest showed increases in ponds, but the habitat quality of those ponds provided little cover for ducklings.

The Agriculture, Food, and Rural Revitalization unit, part of the Saskatchewan Provincial Government, surveys landowners about agricultural and moisture conditions around the Province and distributes a weekly crop report on the survey's findings. According to the 20 July Crop Report (Saskatchewan Agriculture, Food, and Rural Revitalization 2003), pasture and hayland was reported as only 24% adequate across the southern Saskatchewan grainbelt. These reports varied widely across the grainbelt from a low of 6% of pasture and hayland reported as adequate in the southwest to 67% adequate in the northeast. The northwest grainbelt remained a hard place to raise cattle and ranchers were experiencing or anticipating water shortages again this year.

June temperatures across the Province were average (Agriculture and Agri-food Canada 2003). Although official July temperatures were unavailable, unofficial reports indicated that temperatures were slightly warmer than normal.

PRODUCTION INDICES: The overall brood index was 271%, 56%, and 7% higher than 2002, the 10-year mean, and the long-term mean, respectively, and was the 15th highest estimate since 1955 (Table 3, Appendix 1). We counted 756 duck broods during the survey, a 271% increase from 2002 (n = 203). The composition of duck broods by age class (Gollup and Marshall 1954) was as follows: Class I, 27.4% (n = 207); Class II, 56.6% (n = 428); Class III, 16.0% (n = 121); unclassified, 3.3% (n = 25). The average brood size among the intact Class II and III broods observed (n = 374) during our survey was 5.6, which is higher than 2002 ($\bar{x}$ = 5.2) and the long-term mean ($\bar{x}$ = 5.2), but about the same as the 10-year mean ($\bar{x}$ = 5.5 (Table 3). The 2003 coot brood index of 31.4 was well above 2002's record low index of 1.5, 22% higher than the 10-year mean, and 15% higher than the long-term mean, respectively (Table 3).

LATE-NESTING INDICES: The late-nesting index (LNI) is a rough measure of renesting effort, or potential broods that will hatch after our survey (Henny et al. 1972). The 2003 total LNI was 6% lower than the 2002 LNI, 5% lower than the 10-year mean, and 18% lower than the long-term mean (Table 3). The dabbling duck species LNI was 20% lower than 2002. The total LNI for diving ducks was 123% higher than the 2002 LNI, but remained 11% lower than the long-term mean. When the brood index and total LNI are combined (199.5), 2003 ranks as the 19th highest estimate since 1955 (Appendix 1).

DISCUSSIONS: Although dry conditions are still present in the Province, conditions are much better than 2002. A wet spring and good runoff attracted ducks back to the prairies of

southern Saskatchewan. Delays in farming, especially in the south may have aided early nesting species by allowing stubble nesting birds to get off first clutches before farming equipment made it into the fields to summer fallow.

The 2003 LNI was slightly lower than 2002, the 10-year mean, and the long-term mean. A low LNI results from not seeing as many lone males or duck pairs. Last year it was apparent that the LNI was low because very little nesting effort occurred in the Province; this was corroborated by ground studies and from our brood index. This year, duck populations were abundant and ground crews reported a good nesting effort was underway. While the LNI can be interpreted differently depending on the year, the brood index is a more straightforward measure of recruitment. The best use of the July data is to use the 2 indices together. The brood index this year was 271% higher than the 2002 brood index and was the 15th highest on record. This, combined with the low LNI, would indicate that early nests probably were successful and the high brood counts indicate good brood survival. If ducks had nested later due to weather or other factors, we likely would have had a higher LNI because our indicators (i.e, lone males and/or duck pairs) would have still been present and maintaining their pair bonds. When both indices are looked at together, it appears that southern Saskatchewan had a good production year and fall recruitment out of the Province should be good.

Precipitation across the Province varied widely both in the spring and early summer. Since the May survey, potential brood habitat had dried up in the extreme southwest, northwest, east-central, and northeast portions of the survey area and areas rated as fair for production in May were poor in July. The southern grasslands had good habitat conditions; wetlands were retaining water into the emergent vegetation and the potential for recruitment from this area remained good. The central areas of the grasslands around Old Wives Lake were in good to excellent condition, numerous broods were observed and production and recruitment appeared to be good to excellent in this area. Likewise, habitat conditions in the southern part of stratum 31 also looked good and wetland vegetation was providing good cover for broods. Although wetland numbers were higher than 2002, wetland conditions in the northwest and west-central portions of the survey area were less favorable to brood rearing because water levels were drawndown out of the emergent vegetation and provided little cover for broods. Although it appears that recruitment will be good from southern Saskatchewan, the Province is still dry and there is room for improvement in many areas. It appears that the Province is on the verge of either breaking out of the drought or sinking back into it.

ACKNOWLEDGEMENTS: We appreciate the Manitoba crew for providing data for strata 34-35. Thomas Lewis provided helpful comments to improve this report.

Submitted by Philip P. Thorpe, July 31, 2003

LITERATURE CITED

Agriculture and Agri-food Canada. 2003. Drought Watch on the Prairies. (http://www.agr.gc.ca/pfra/drought/index_e.htm).

Gollup, J. B., and W. H. Marshall. 1954. A guide for aging duck broods in the field. Mississippi Flyway Council Technical Section, Minneapolis, MN. 14pp.

Henny, C. J., D. R. Anderson, and R. S. Pospahala. 1972. Aerial surveys of waterfowl production in North America, 1955-1971. U.S. Fish and Wildlife Service Special Scientific Report 160.

Saskatchewan Agriculture, Food, and Rural Revitalization. 2003. Crop Report, July 21, 2003. Report Number 16. (http://www.agr.gov.sk.ca/docs/reports/crop_report/crprpt030721.asp).

Saskatchewan Watershed Authority. 2003. (http://www.saskwater.com/hydrology/forecastadvisory.htm)

Thorpe, P. P. 2000. Waterfowl Breeding Population Survey for Southern Saskatchewan. Division of Migratory Bird Management, U. S. Fish and Wildlife Service. Denver, Colorado.

Table 1. Survey design and July 2003 coverage for Southern Saskatchewan.

	Stratum						
	30	31	32	33	34	35	Total
Survey design:							
Square miles in stratum	18,570	21,086	37,911	11,345	13,164	9,044	111,120
Square miles in sample- waterfowl/ponds	76.50	72.00	285.75	45.00	87.75	63.00	630.00
Linear miles in sample	612	576	2,286	360	702	504	5,040
Number of transects in sample	4	5	14	6	5	6	40
Number of segments in sample	34	32	127	20	39	28	280
Expansion factor	242.745	292.861	132.672	252.111	150.017	143.556	
July 2003 coverage:							
Square miles in sample- waterfowl/ponds	76.50	72.00	285.75	45.00	87.75	63.00	630.00
Linear miles in sample	612	576	2,286	360	702	504	5,040
Number of transects in sample	4	5	14	6	5	6	40
Number of segments in sample	34	32	127	20	39	28	280
Expansion factor	242.745	292.861	132.672	252.111	150.017	143.556	

Table 2. Long-term trend in July pond estimates[1] (thousands) by stratum and comparisons with the previous year, the 10-year mean (1993-2002), the long-term mean (1955-2002), and May 2003 pond estimates [2] for Southern Saskatchewan.

	Stratum						
Year	30	31	32	33	34	35	Total
1955	138.6	332.1	374.5	120.5	668.5	449.0	2,083.2
1956	120.9	186.8	210.1	34.8	346.5	216.2	1,115.3
1957	59.0	136.8	127.6	18.9	260.8	77.4	680.5
1958	57.0	82.8	69.1	18.4	127.9	46.1	401.3
1959	40.1	95.9	123.0	31.5	155.6	74.1	520.2
1960	47.3	104.0	136.8	16.9	229.7	102.5	637.2
1961	41.0	35.6	51.1	10.3	32.8	22.4	193.2
1962 [3]	29.9	40.0	62.6	12.4	-	-	144.8
1963	93.0	97.2	227.8	41.6	177.5	89.4	726.5
1964	33.5	82.5	99.2	13.1	141.9	144.3	514.5
1965	112.4	188.7	289.1	88.7	167.5	69.5	915.9
1966	149.0	320.8	239.9	72.9	164.3	105.2	1,052.1
1967	86.4	136.5	192.6	44.6	101.1	50.2	611.6
1968	66.3	96.2	88.5	15.9	41.1	20.2	328.2
1969	125.4	151.8	357.0	63.0	86.6	159.2	943.1
1970	278.3	365.8	568.2	70.1	219.3	209.6	1,711.4
1971	159.1	277.5	335.9	41.9	171.7	91.6	1,077.7
1972	116.5	189.7	154.8	25.2	108.0	107.4	701.6
1973	153.1	442.7	145.3	21.7	103.5	52.4	918.6
1974	262.5	309.9	455.3	57.5	252.5	175.0	1,512.7
1975	216.7	299.6	391.1	69.1	282.5	281.9	1,540.8
1976	165.1	254.5	414.3	55.2	266.7	211.5	1,367.3
1977	101.6	187.4	183.0	19.9	154.1	72.2	718.1
1978	82.1	177.8	240.1	50.4	165.3	135.7	851.4
1979	159.6	230.8	274.2	46.9	169.2	155.8	1,036.4
1980	77.3	109.8	90.4	21.9	63.0	32.7	395.1
1981	75.7	87.0	96.3	22.9	52.2	29.6	363.7
1982	130.9	197.1	372.5	122.0	86.0	55.4	963.9
1983	134.8	313.9	237.5	44.1	366.3	99.1	1,195.7
1984	126.8	218.8	140.1	21.7	103.4	41.9	652.6
1985	186.2	292.9	173.8	20.9	177.5	55.8	907.1
1986	188.0	218.8	170.0	36.3	171.3	90.0	874.3
1987	126.8	183.3	123.7	27.7	115.1	63.0	639.6
1988	120.4	126.5	94.1	36.6	41.3	23.4	442.2
1989	101.2	108.4	129.6	36.3	51.6	31.9	459.0
1990	101.2	135.0	135.5	21.7	96.3	48.8	538.5
1991	187.4	210.6	722.3	165.6	228.5	177.1	1,691.5
1992	87.6	101.6	132.5	24.5	135.5	77.4	559.1
1993	237.9	271.5	301.0	47.6	281.1	136.8	1,276.0
1994	248.8	314.5	501.6	74.1	256.5	110.4	1,506.0
1995	122.1	252.7	237.6	77.9	261.8	115.4	1,067.6
1996	227.2	306.0	464.4	82.4	380.1	206.4	1,666.6
1997	158.8	271.8	430.8	86.0	310.4	169.8	1,427.5
1998	158.0	325.7	311.9	73.4	476.2	320.0	1,665.2
1999	201.2	405.6	684.6	47.4	205.5	149.4	1,697.1
2000	124.1	201.5	299.9	52.1	446.5	313.8	1,437.9
2001	70.6	103.4	160.4	23.7	319.5	263.3	940.9
2002	68.7	99.9	237.2	110.4	111.3	98.6	726.1
2003	90.0	139.7	315.6	63.8	153.3	92.0	854.4
10-year mean	161.7	255.3	363.7	67.5	304.9	188.4	1341.5
Long-term mean	130.3	205.1	255.4	49.5	198.5	124.0	962.9
Percent Change from:							
2002	31%	40%	29%	-42%	38%	-7%	17%
10-year mean	-44%	-45%	-13%	-6%	-50%	-51%	-36%
Long-term mean	-31%	-32%	24%	29%	-23%	-26%	-11%
May ponds 2003	136.8	275.5	851.1	258.7	333.6	287.2	2142.9
Percent change:							
May to July 2003	-34%	-49%	-63%	-75%	-54%	-68%	-60%

[1] July ponds are raw counts multiplied by an expansion factor (Table 1) and are not adjusted for visibility bias.

[2] May ponds are raw counts multiplied by an expansion factor (Table 1) and are adjusted using a visibility correction factor of 1.10 for strata 30-33 and 1.50 for strata 34-35.

[3] Incomplete coverage, not included in long-term mean calculation.

Table 3. Status of waterfowl brood and late-nesting indices (thousands, unadjusted for visibility bias) by stratum and comparisons with the previous year, the 10-year mean (1992-2002) [1], and the long-term mean (1955-2002) [2] for Southern Saskatchewan, July 2003.

	Stratum						2003	2002	10-year	Long-term	Percent Change from:		
Species	30	31	32	33	34	35	total	total	mean	mean	2002	10-year mean	Long-term mean
Broods:													
Duck brood index	13.6	19.6	56.1	14.1	14.4	11.9	129.8	35.0	83.0	121.6	271%	56%	7%
Average brood size [3]	5.81	5.10	6.10	5.62	5.39	5.59	5.6	5.2	5.5	5.2	8%	3%	8%
Coot brood index	0.7	4.7	6.8	2.8	11.4	5.0	31.4	1.5	25.8	27.3	2054%	22%	15%
Late nesting index (LNI): [4]													
Dabblers:													
Mallard	1.5	2.3	10.3	1.7	9.6	4.7	30.2	36.6	24.4	27.7	-17%	24%	9%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Gadwall	0.0	0.3	1.5	0.0	0.3	0.8	2.9	6.6	8.4	9.2	-57%	-66%	-69%
Am. wigeon	0.0	0.3	0.7	0.0	0.6	0.1	1.7	2.6	2.8	4.5	-36%	-40%	-62%
Green-winged teal	0.0	0.3	0.5	0.0	0.6	0.1	1.6	3.1	4.0	3.0	-49%	-61%	-48%
Blue-winged teal [5]	0.0	0.6	2.9	1.0	3.2	1.0	8.7	11.2	11.5	12.1	-22%	-24%	-28%
N. shoveler	0.2	0.6	1.1	0.3	0.5	0.1	2.8	1.0	2.4	3.7	184%	16%	-24%
N. pintail	0.0	0.0	3.4	0.5	1.1	0.6	5.6	5.6	3.9	6.9	-1%	41%	-20%
Subtotal:	1.7	4.4	20.4	3.5	15.9	7.5	53.4	66.7	57.5	67.1	-20%	-7%	-20%
Divers:													
Redhead	0.0	0.0	0.5	0.3	0.3	0.0	1.1	0.6	1.7	2.2	84%	-38%	-53%
Canvasback	0.5	0.0	0.1	0.0	0.2	0.1	0.9	0.1	0.7	1.2	565%	25%	-29%
Scaups	0.5	0.6	0.9	0.2	0.6	0.4	3.2	1.8	3.0	6.3	78%	9%	-49%
Ring-necked duck	0.0	0.0	0.1	0.0	0.2	0.3	0.5	1.0	1.1	0.8	-45%	-52%	-33%
Goldeneyes	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.5	0.2	66%	-6%	113%
Bufflehead	0.0	0.0	0.1	0.0	0.2	0.1	0.4	0.7	0.6	0.6	-42%	-38%	-29%
Ruddy duck	0.7	1.2	1.9	1.0	2.8	1.4	9.0	2.5	7.7	6.2	256%	17%	45%
Subtotal:	2.2	1.8	3.6	1.5	4.3	2.3	15.6	7.0	15.4	17.6	123%	2%	-11%
Miscellaneous:													
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0%	-100%	-100%
Mergansers	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.2	0.1	265%	103%	413%
Subtotal	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.3	0.3	265%	69%	60%
Total LNI	4.4	6.1	24.1	4.9	20.1	9.9	69.5	73.8	73.2	85.0	-6%	-5%	-18%

[1] Excludes 1999, data in strata 34-35 was not collected using correct survey methodology.

[2] Excludes 1962, which had incomplete coverage, and 1999 because of incorrect data collection in strata 34-35.

[3] Calculated using only Class II and III broods observed and assumed to be complete.

[4] Only observed adult pairs and singles used.

[5] Includes cinnamon teal.

Appendix 1. Long-term trend in waterfowl brood and late-nesting indices (thousands, unadjusted for visibility bias) by species in Southern Saskatchewan, 1955-2003.

Species/Year	1955	1956	1957	1958	1959	1960	1961	1962 [1]	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Broods:																				
Duck brood index	236.2	368.6	588.7	275.5	103.8	121.0	71.9	28.5	46.2	67.8	46.8	95.9	94.6	77.8	175.0	128.7	180.2	170.2	96.7	148.3
Average brood size [2]	6.7	6.0	6.2	4.2	4.1	4.7	4.6	5.5	5.4	5.8	6.0	5.8	5.4	5.0	5.6	5.3	5.2	5.2	4.7	5.0
Coot brood index	18.9	65.0	208.0	21.6	5.9	15.1	5.8	0.0	1.9	9.0	6.8	8.0	11.6	11.9	20.7	22.4	35.6	25.6	21.4	40.6
Late nesting index (LNI): [3]																				
Dabblers:																				
Mallard	90.4	52.3	27.1	49.7	23.6	40.8	5.7	5.9	15.4	10.9	29.8	25.8	14.8	12.4	30.5	65.4	37.0	25.6	33.1	37.2
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	11.9	9.2	2.1	4.4	1.3	9.7	0.3	1.3	5.8	2.2	13.1	9.5	8.9	4.8	18.9	23.0	10.8	6.2	9.2	16.6
Am. wigeon	10.5	8.9	2.7	7.6	4.4	5.9	0.3	1.3	2.0	0.1	5.5	3.7	4.0	2.1	11.5	24.2	9.0	6.2	5.4	4.4
Green-winged teal	3.0	2.5	0.4	1.4	0.3	0.4	0.0	0.0	0.6	0.0	1.6	1.7	1.9	3.2	2.9	11.8	7.4	5.2	4.8	1.0
Blue-winged teal [4]	35.3	30.6	6.1	18.5	18.4	12.7	1.0	0.7	5.2	3.8	11.4	13.9	14.3	4.3	14.6	17.5	15.4	9.2	7.7	14.0
N. shoveler	10.6	7.2	1.4	3.8	1.2	3.9	0.4	0.3	1.7	1.1	6.7	2.7	3.6	1.4	6.9	13.2	6.1	1.8	3.8	6.2
N. pintail	23.9	11.1	3.8	8.6	1.1	3.6	0.8	2.3	4.3	0.8	4.7	6.3	5.4	3.2	19.0	41.1	24.0	8.0	5.0	11.9
Subtotal:	185.6	121.7	43.6	93.9	50.3	77.1	8.4	11.8	35.0	19.0	72.8	63.7	52.9	31.3	104.4	196.3	109.8	62.3	69.1	91.2
Divers:																				
Redhead	4.2	5.5	0.9	2.4	0.4	1.7	0.0	0.3	1.0	1.1	2.3	2.1	2.8	1.5	2.1	3.5	1.9	2.6	2.1	2.7
Canvasback	5.6	2.6	0.5	1.8	0.9	0.4	0.2	0.0	0.5	0.3	0.7	0.3	1.1	1.4	0.5	3.9	2.2	1.1	2.7	1.7
Scaups	18.4	11.9	12.3	10.2	3.9	5.2	0.8	0.3	1.9	4.0	2.3	5.1	1.7	1.4	6.8	13.7	8.3	7.4	6.4	6.6
Ring-necked duck	2.4	0.1	0.2	0.8	0.7	0.0	0.1	0.0	1.1	0.0	0.5	0.3	0.3	0.0	0.1	0.5	0.0	0.2	0.9	1.9
Goldeneyes	0.0	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.4	0.0
Bufflehead	0.8	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.0	0.1	0.6	1.6	0.6	0.5	2.1	0.5	0.5	0.2	0.4	0.7
Ruddy duck	10.8	9.5	3.0	5.3	3.0	3.9	0.1	0.4	2.7	1.7	2.7	6.3	5.4	3.7	3.5	3.4	12.3	6.7	5.6	10.5
Subtotal:	42.3	29.7	16.8	20.6	9.4	12.0	1.7	0.9	7.2	7.2	9.0	15.6	12.0	8.5	15.1	27.1	25.1	18.3	18.4	24.1
Miscellaneous:																				
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	1.7	0.2	0.0	0.2	0.5	0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Mergansers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Subtotal	1.7	0.2	0.0	0.2	0.5	0.7	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0
Total LNI	229.6	151.7	60.4	114.7	60.2	89.8	10.0	12.7	43.1	26.3	81.9	79.3	64.9	39.9	119.9	223.4	134.9	80.6	87.8	115.4

[1] Incomplete survey coverage.

[2] Calculated using only class II and III broods observed and assumed to be complete.

[3] Only observed adult pairs and singles used.

[4] Includes cinnamon teal.

Appendix 1 (continued).

Species/Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Broods:																				
Duck brood index	148.2	169.0	144.6	130.0	107.2	130.6	77.9	63.3	69.5	70.6	94.9	100.9	105.4	74.3	58.4	68.3	58.5	63.2	19.2	87.8
Average brood size[2]	4.7	4.5	5.2	4.7	5.3	4.6	4.3	4.8	4.5	4.7	5.3	5.7	5.2	4.6	4.7	4.3	5.4	5.1	4.8	6.2
Coot brood index	45.0	46.0	24.8	28.3	34.0	34.2	12.5	14.8	15.6	21.6	34.9	54.3	32.9	11.6	6.4	18.9	7.2	29.5	3.8	12.5
Late nesting index (LNI): [3]																				
Dabblers:																				
Mallard	45.7	40.3	36.1	26.4	51.9	14.2	15.4	34.6	32.1	16.2	20.7	13.3	7.9	5.4	8.9	10.7	23.7	19.6	13.7	19.5
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	17.6	25.3	20.3	15.6	19.2	4.3	7.2	17.1	8.6	1.1	6.5	6.0	1.3	0.1	1.8	3.4	16.5	10.5	6.3	4.5
Am. wigeon	7.0	6.8	4.9	4.5	8.9	1.0	2.4	6.3	2.8	1.4	2.2	1.7	0.3	1.5	0.8	0.9	5.9	3.7	3.4	2.7
Green-winged teal	4.8	7.4	2.6	2.9	6.9	2.1	2.7	3.1	3.8	1.5	1.8	2.8	0.3	0.8	0.5	1.2	3.0	0.7	0.5	1.9
Blue-winged teal [4]	12.1	21.4	22.4	9.3	21.6	8.7	8.9	13.4	14.4	12.2	7.5	9.8	1.6	4.6	2.2	3.3	13.0	6.8	6.6	6.3
N. shoveler	9.4	14.9	4.8	3.0	5.7	1.2	2.7	4.8	4.4	0.1	1.7	0.9	0.3	0.7	0.1	1.1	4.5	1.6	1.1	1.6
N. pintail	15.2	15.3	13.8	8.1	9.1	4.4	4.1	4.3	4.8	2.7	3.4	1.4	0.7	1.5	0.4	0.8	3.0	3.0	1.3	2.4
Subtotal:	111.8	131.4	104.8	69.7	123.4	35.9	43.5	83.7	70.8	35.3	43.7	35.9	12.2	14.5	14.6	21.3	69.6	45.9	33.1	38.9
Divers:																				
Redhead	7.1	8.1	4.4	2.9	5.5	3.2	1.5	2.7	3.7	0.6	1.9	0.4	0.1	0.2	0.0	0.7	1.4	3.1	0.5	1.3
Canvasback	2.2	2.8	5.7	1.6	2.0	1.0	0.6	0.3	1.3	1.0	0.7	0.8	1.0	0.0	0.0	0.1	0.7	0.6	1.1	0.3
Scaups	10.1	12.4	13.7	11.2	24.6	3.7	5.1	12.4	13.7	8.7	6.5	3.1	2.2	0.6	1.4	1.8	1.5	3.9	1.9	1.8
Ring-necked duck	1.1	1.9	1.2	1.6	3.1	0.8	0.3	1.0	0.9	0.0	1.0	0.5	0.4	0.8	0.0	0.9	0.0	0.5	0.8	0.5
Goldeneyes	0.0	0.0	0.0	0.2	0.6	0.0	0.2	0.0	0.9	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	1.5	0.6	0.3
Bufflehead	1.6	1.8	1.7	0.7	2.1	0.5	0.0	0.6	0.7	0.0	0.1	0.2	0.0	0.5	0.0	0.0	0.0	0.4	0.4	0.3
Ruddy duck	10.6	16.0	9.9	5.4	13.0	2.5	2.7	5.2	13.9	3.5	7.0	6.9	2.3	1.5	1.9	1.4	6.4	7.4	4.2	5.2
Subtotal:	32.7	42.9	36.6	23.6	50.8	11.6	10.4	22.2	35.1	13.8	17.5	11.9	6.2	3.6	3.3	4.9	10.0	17.4	9.5	9.7
Miscellaneous:																				
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	1.1	0.0	0.8	1.4	0.7	0.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Mergansers	0.0	0.0	0.0	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.2
Subtotal	1.1	0.0	0.8	1.6	0.7	1.1	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.2	0.2
Total LNI	145.6	174.2	142.3	94.9	174.9	48.6	53.9	106.0	105.9	49.1	61.2	47.9	18.6	18.1	17.9	26.6	79.5	63.3	42.8	48.8

[1] Incomplete survey coverage.

[2] Calculated using only class II and III broods observed and assumed to be complete.

[3] Only observed adult pairs and singles used.

[4] Includes cinnamon teal.

Appendix 1 (continued).

Species/Year	1995	1996	1997	1998	1999[5]	2000	2001	2002	2003
Broods:									
Duck brood index	78.9	129.3	161.3	67.3	82.3	91.5	96.4	35.0	129.8
Average brood size[2]	5.6	5.9	5.6	5.5	6.6	5.4	6.3	5.2	5.6
Coot brood index	6.7	63.5	48.5	19.8	41.5	37.3	34.9	1.5	31.4
Late nesting index (LNI): [3]									
Dabblers:									
Mallard	11.8	34.0	23.8	26.6	106.8	33.2	25.2	36.6	30.2
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	7.5	17.7	5.5	11.1	36.8	9.1	5.4	6.6	2.9
Am. wigeon	2.1	4.6	1.7	1.9	3.6	2.5	2.9	2.6	1.7
Green-winged teal	1.3	10.1	4.2	9.1	16.5	5.9	3.3	3.1	1.6
Blue-winged teal [4]	7.6	31.9	10.2	15.0	37.0	11.5	8.3	11.2	8.7
N. shoveler	2.4	5.7	1.8	2.4	11.7	3.8	2.5	1.0	2.8
N. pintail	3.0	3.8	5.9	4.3	6.6	4.6	5.5	5.6	5.6
Subtotal:	35.7	107.9	53.0	70.4	219.0	70.6	53.1	66.7	53.4
Divers:									
Redhead	1.5	3.1	1.8	2.7	10.4	1.3	1.1	0.6	1.1
Canvasback	0.9	0.5	1.3	0.7	0.9	1.3	0.2	0.1	0.9
Scaups	2.3	4.4	2.0	2.8	7.2	4.2	4.4	1.8	3.2
Ring-necked duck	1.3	2.1	0.2	0.2	3.8	2.9	1.6	1.0	0.5
Goldeneyes	0.0	0.4	0.5	0.0	0.3	0.0	1.4	0.3	0.5
Bufflehead	0.0	0.5	0.5	0.7	0.0	2.5	0.5	0.7	0.4
Ruddy duck	7.1	13.6	9.4	8.0	31.6	13.6	6.1	2.5	9.0
Subtotal:	13.1	24.8	15.7	15.1	54.2	25.9	15.3	7.0	15.6
Miscellaneous:									
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.2	0.3	0.2	0.4	0.5	0.8	0.1	0.5
Subtotal	0.0	0.2	0.3	0.5	0.4	0.5	0.8	0.1	0.5
Total LNI	48.8	133.0	69.0	86.0	273.6	97.1	69.2	73.8	69.5

[1] Incomplete survey coverage.
[2] Calculated using only class II and III broods observed and assumed to be complete.
[3] Only observed adult pairs and singles used.
[4] Includes cinnamon teal.
[5] Late nesting data for strata 34 and 35 was not collected according to survey methodology, 1999 data are not used in averages or comparisons.